REMARKS

In paragraph 1 of the Office Action Applicant's election without traverse of the invention of Group II, Claims 37 through 43 in the reply filed on June 9, 2006 is acknowledged, stating:

> "Claims 21 through 26 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.
>
> Claims 37-43 are pending for examination as noted below."

Responsive hereto, Applicant confirms its election of claims 37-43.

In paragraph 2 of the Office Action it is noted that this application appears to claim subject matter disclosed in prior Application No. 09/772,780, filed on January 29, 2001, stating:

> "A reference to the prior application must be inserted as the first sentence(s) of the specification of this application or in an application data sheet (37 CFR 1.76), if applicant intends to rely on the filing date of the prior application under 35 U.S.C. 119(e), 120, 121, or 365(c). See 37 CFR 1.78(a). For benefit claims under 35 U.S.C. 120, 121, or 365(c), the reference must include the relationship (i.e., continuation, divisional, or continuation-in-part) of all nonprovisional applications. If the application is a utility or plant application filed under 35 U.S.C. 111(a) on or after November 29, 2000, the specific reference to the prior application must be submitted during the pendency of the application and within the later of four months from the actual filing date of the application or sixteen months from the filing date of the prior application. If the application is a utility or plant application which entered the national stage from an international application filed on or after November 29, 2000, after compliance with 35 U.S.C. 371, the specific reference must be submitted during the pendency of the application and within the later of four months from the date on which the national stage commenced under 35 U.S.C. 371(b) or (f) or sixteen months from the filing date of the prior application. See 37 CFR 1.78(a)(2)(ii) and (a)(5)(ii). This time period is not extendable and a failure to submit the reference required by 35 U.S.C. 119(e) and/or 120, where applicable, within this time period is considered a waiver of any benefit of such prior application(s) under 35 U.S.C. 119(e), 120, 121 and 365(c). A benefit claim filed after the required time period may be accepted if it is accompanied by a grantable petition to accept an unintentionally delayed benefit claim under 35 U.S.C. 119(e), 120, 121 and 365(c). The petition must be accompanied by (1) the reference required by 35 U.S.C. 120 or 119(e) and 37 CFR 1.78(a)(2) or (a)(5) to the prior application (unless previously submitted), (2) a surcharge under 37 CFR 1.17(t), and (3) a statement that the entire delay between the date the claim was due under 37 CFR 1.78(a)(2) or (a)(5) and the date the claim was filed was unintentional. The Director may require additional information where there is a question whether the delay was unintentional. The petition should be addressed to: Mail Stop Petition, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

> If the reference to the prior application was previously submitted within the time period set forth in 37 CFR 1.78(a), but not in the first sentence(s) of the specification or an application data sheet (ADS) as required by 37 CFR 1.78(a) (e.g., if the reference was submitted in an oath or declaration or the application transmittal letter), and the information concerning the benefit claim was recognized by the Office as shown by its inclusion on the first filing receipt, the petition under 37 CFR 1.78(a) and the surcharge under 37 CFR 1.17(t) are not required.
>
> Applicant is still required to submit the reference in compliance with 37 CFR 1.78(a) by filing an amendment to the first sentence(s) of the specification or an ADS. See MPEP § 201.11."

Responsive hereto, Applicant has amended the Application to insert a cross-reference to prior application no. 09/772,780, filed on January 29, 2001. Additionally, Applicant has attached herewith a copy of the Filing Receipt which makes reference to the parent application. Applicant submits that a Petition under 37 CFR 1.78(a) and the surcharge under 37 CFR 1.17(p) are not required. Applicant therefore submits that this ground of objection has been satisfied.

In paragraphs 3 and 4 of the Office Action the abstract of the disclosure is objected to because the content is not directed to the claimed subject matter of a process of making (as recited in at least Claim 37). Correction is required. See MPEP § 608.01(b). Responsive hereto, Applicant has submitted an amended Abstract.

In paragraph 5 of the Office Action it is indicated that the title of the invention is not descriptive, stating:

> "A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: --A Method of Manufacturing a Magnetic Head with Thin Gap Layers--."

Responsive hereto, Applicant has amended the title accordingly, whereby this ground of objection has been satisfied.

In paragraph 6 of the Office Action claims 37 and 38 are objected to because of the following informalities, stating:

> In Claim 37, the phrase of "a magnetic shield" (line 3) should be replaced with --the first magnetic shield--; "said gap layer" (line 4) should be replaced with --said first gap insulation layer--; and "the" (line 5) should be removed. In Claim 38, the phrase of "a substrate layer" (line 3) should be replaced with --the wafer substrate- Appropriate correction is required."

Responsive hereto, Applicant has amended claims 37 and 38 to cure these informalities, and Applicant has further amended claims 37 and 38 in response to the prior art rejections, as is more fully described herebelow. Applicant submits that this ground of objection has been satisfied.

In paragraphs 7 and 8 of the Office Action claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shoujii et al 5,722,157 in view of Hsiao et al 5,999,379, stating:

> "Shoujii discloses a method for fabricating a magnetic head (see Figures 8A through 8K) comprising: depositing a first magnetic shield layer (e.g. 18) upon a wafer substrate (e.g. 16); sensor (e.g. 28) upon the first gap insulation layer; fabricating electrical leads (e.g. 30, 31) proximate to the sensor, the leads providing electrical current to the sensor during operation; fabricating a second gap insulation layer (e.g. 32) upon the electrical leads and the sensor; and fabricating a second magnetic shield (e.g. 34) upon the second gap insulation layer.
>
> Shoujii does not teach that the second gap insulation layer includes a first gap insulation layer portion and a second gap insulation layer portion where the first and second gap insulation layer portions are made up of a plurality of multilayered laminations.
>
> Hsiao teaches forming a second gap insulation layer upon a sensor (e.g. SV in Fig. 37) that includes a first gap insulation layer portion (e.g. 260) and a second gap insulation layer portion (e.g. 217) where the first and second gap insulation layer portions are made up of a plurality of multilayered laminations (e.g. 231, 251, 217, 260). The purpose of the multilayered laminations with the first gap insulation layer portion and the second gap insulation layer portion of the second gap insulation layer is to prevent electrical shorting between the lead layers and the shield layers (col. 3, lines 3-6 and lines 33-36).
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the second gap insulation layer of Shoujii by forming it upon the sensor with the first gap insulation layer portion and the second gap insulation layer portion where the first and second gap insulation layer portions are made up of a plurality of multilayered laminations, as taught by Hsiao, to advantageously prevent electrical shorting between the lead layers and the shield layers."

Responsive hereto, Applicant has amended independent claim 37 to recite limitations that are not taught by nor obvious from the cited prior art.

Firstly, with regard to Applicant's invention, as now set forth in amended independent claim 37, Applicant directs the Examiner's attention to Figs. 6 and 7 of the Application. With regard to Fig. 6, a first portion 112 of the second gap insulation layer 108 is fabricated upon the electrical leads 74; there is a mask (see Fig. 4) that covers the central sensor layers 66 during the

fabrication of this first portion 112 of the second gap layer 108. The first portion 112 is comprised of a plurality of multi-layered laminations 116, those being depicted in Fig. 6. Thereafter, as depicted in Fig. 7, a second portion 180 of the second gap insulation layer 108 is fabricated. As depicted in Fig. 7, the second portion 180 includes a plurality of multi-layered laminations 184 that are fabricated upon both the sensor layers 66 and upon the first portion 112, which is disposed upon the electrical leads 74.

The cited prior art neither teaches nor renders obvious this second insulation layer structure, nor the method for fabricating it that is described in amended independent claim 37, as is next discussed.

Regarding Shoujii et al., as is set forth in the rejection, it teaches the well known prior art sensor structure in which a second gap insulation layer is fabricated upon the sensor layers and upon the electrical leads. Applicant agrees with the comment in the rejection that "Shoujii does not teach that the second gap insulation layer includes a first gap insulation layer portion and a second gap insulation layer portion where the first and second gap insulation layer portions are made up of a plurality of multilayered laminations."

Regarding Hsiao, Applicant has amended independent claim 37 to set forth further limitations that are not obvious from the teachings of Hsiao. Particularly, the limitations that the first gap insulation layer portion is a multi-layer structure that is fabricated upon the electrical leads, and the second gap insulation portion is a multi-layer structure that is fabricated upon both the sensor and the first gap insulation layer portion.

A review of Hsiao reveals that it teaches a first metal layer portion 217 that is fabricated upon the sensor (and not the electrical leads), as the electrical leads have not even been fabricated at the time of the deposition of layer 217, as is depicted in Fig. 13, which is taken from lines 13-13 of Fig. 11 across the edge of the sensor. Thereafter, Hsiao teaches the fabrication of the electrical leads 230 and a metal layer 231 (not a multi-layer) solely upon the electrical leads, as is depicted in Fig. 15, which is taken across an upper electrical lead location 15-15 of Fig. 14. Thereafter, following milling and filling steps, Hsiao teaches (see Figs. 30 and 31) the fabrication of a further upper electrical lead portion 250 away from the sensor, followed by the fabrication of a further metal layer 251 upon the further electrical lead portion 250.

Thereafter, although most pertinent to dependent claim 38 discussed herebelow, Hsiao conducts a single oxidation step following the removal of masks, in which each of the metal layers 217, 231 (where exposed) and 251 are oxidized to become insulating, oxidized layers. It

is significant that the portion of the metal layer 231 that is disposed beneath the upper electrical lead 250 (see Fig. 31) is not exposed and thus not oxidized, such that electrical current flows through it from lead 230 to lead 250. Thereafter, a further gap insulation layer G2 260 is deposited upon the oxidized insulation layers 217, 231 and 251, and the second magnetic shield S2 262 is then fabricated upon the G2 insulation layer 260, as can be seen in Figs. 36 and 37.

Applicant therefore respectfully submits that the combined teachings of Shoujii and Hsiao fail to teach or render obvious Applicant's claimed insulation layer structure, in which a multi-layer first gap insulation portion 112 is fabricated upon the electrical leads 74, followed by a multi-layer second gap insulation portion that is fabricated upon both the first multi-layer gap insulation portion 112 and the sensor 66. Specifically, in Hsiao the only insulation layer that is fabricated above both the electrical leads and the sensor is the G2 insulation layer 260, and it is not a multi-layer structure. Additionally, the G2 layer is not fabricated upon the sensor, but rather upon the oxidized insulation gap layer 217 that has initially been fabricated upon the sensor.

Applicant therefore respectfully submits that amended independent claim 37 recites limitations regarding the two multi-layer gap insulating portions that are neither taught by nor obvious from the cited prior art.

In paragraph 9 of the Office Action claims 38, 39 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoujii et al in view of Hsiao et al, as applied to claim 37 above, and further in view of Otani 5,340,793, stating:

> "Shoujii, as modified by Hsiao, discloses the method of manufacturing the magnetic head as relied upon above in Claim 37.
>
> Regarding Claim(s) 38, 39 and 41, Hsiao further teaches that the second gap insulation layer includes substeps of: depositing a thin film of metal (e.g. 231) on the wafer substrate and oxidizing the thin film metal to from a first metal oxide lamination (col. 6, lines 62+); and depositing a second sheet of metal (e.g. 251) on top of the first lamination and oxidizing the second sheet of metal to form a second lamination (col. 7, lines 46+). Hsiao further teaches that the multilayer structure can be formed of an oxide of aluminum (col. 9, lines 1-2) or tantalum (col. 6, lines 47-48) and that it can comprise of at least 5 laminations of oxide layers (e.g. 243, 217, 251, 231, 260).
>
> The modified Shoujii method does not mention repeating steps c and d (e.g. depositing and oxidizing the second sheet of metal) to achieve the multilayered laminated structure of a desired thickness.

> Otani discloses a piling process of oxide layers that repeats steps of depositing a second sheet of metal on top of a first sheet of metal or lamination, oxidizing the second sheet of metal, and repeating these steps to achieve a multilayered laminated structure (see Fig. 2a and col. 3, lines 47+). The benefit of such a piling process allows deposition to occur in a flat manner (col. 2, lines 29-32) and solves the problems associated with uneven surface layers (col. 1, lines 52- It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Shoujii and Hsiao, by utilizing the piling process that includes repeating steps of depositing the second sheet of metal on top of the first sheet of metal and oxidizing the second sheet of metal, as taught by Otani, to advantageously allow deposition to occur in a flat even manner."

Applicant respectfully traverses this ground of rejection and asserts that amended dependent claim 38 recites limitations that are neither taught by nor obvious from the cited prior art. Applicant further argues that claims 39 and 41 are allowable in that they depend either directly or indirectly from an allowable independent base claim.

Regarding Applicant's invention, as set forth in amended dependent claim 38, Applicant's multi-layer first gap insulation portion 112 is fabricated by depositing a thin metal film, following by an oxidizing step, followed by repeating the metal film deposition and oxidization step a plurality of times. Initially, the first multi-layer gap insulation portion 112 is fabricated upon the electrical leads 74, and subsequently the multi-layer second gap insulation portion 180 is fabricated upon both the sensor structure 66 and the first multi-layer insulation portion 112. The multi-layer second gap insulation portion is fabricated by depositing a thin metallic film followed by the oxidization of the film, where these metallic film deposition and oxidation steps are repeated a plurality of times.

Regarding the prior art, Otani discloses a piling process in which a metallic film is deposited, then oxidized, wherein the metallic film deposition and oxidation process is repeated a plurality of times. However, it is not obvious to combine the teachings of Otani with those of Hsiao as to do so will render Hsiao inoperable. Specifically, Hsiao teaches the deposition of a first thin metallic film 217 upon the sensor (this differs from the electrical lead deposition location of the claimed invention). The metallic film 217 is not oxidized at this time. To incorporate the teachings of Otani would require that the film 217 be fabricated as a multi-layer film including a plurality of thin metallic film deposition followed by oxidation steps.

Thereafter, Hsiao teaches the deposition of a thin metallic film 231, upon the electrical leads; the incorporation of the teachings of Otani would require the substitution of the thin

metallic film 231 with a plurality of steps involving the deposition of thin metal films followed by the oxidation of those films to achieve a multi-layer insulating structure 231 which is fabricated only upon the electrical leads.

Thereafter, away from the sensor, a further electrical lead portion 250 is fabricated upon the now oxidized multi-layer structure 231. However, this will make the Hsiao device inoperable because layer 231 (previously a metallic layer suitable for conducting electrical current between the electrical lead portions 230 and 250) has become an electrical insulation layer through the oxidation thereof.

Thereafter, metallic layer 251 is deposited upon the outer electrical lead portions 250. Incorporating the teachings of Otani would require that the metal layer 251 be replaced with a multi-layer structure of thin metallic films that are subsequently oxidized. Thereafter, Hisao teaches the removal of masks and the oxidation of the surface layers; this step would be omitted if Otani's teachings are incorporated into Hsiao, as described above. Thereafter, the alumina G2 insulation layer 250 of Hsiao is deposited across the device, followed by the second magnetic shield S2 262.

Applicant submits that it is not obvious to combine the teachings of Otani with the teachings of Hsiao as is suggested in the Office Action. To do so results in the Hsiao device becoming inoperable in that Hsiao requires that the layer 231 be a metallic layer when it is located between the electrical lead portion 230 and 250. Incorporating the teachings of Otani results in the layer 231 becoming an insulation layer, resulting in the stoppage of sensor current flow through the electrical leads 230 and 250 of Hsiao.

Applicant therefore respectfully submits that amended dependent claim 38 recites limitations that are neither taught by nor obvious from the cited prior art.

In paragraph 10 of the Office Action claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shoujii et al in view of Hsiao et al and Otani, as applied to claims 37 and 38 above, and further in view of Tsunemitsu et al 3,862,017, stating:

> "Shoujii, as modified by Hsiao and Otani, discloses the claimed manufacturing method as previously discussed in Claims 37 and 38 above. The modified Shoujii method does not teach a nitride. Tsunemitsu teaches that insulating layers can be made of oxides or nitrides (col. 2, lines 6-12) that can include tantalum (e.g. 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the material of the

multilayer structure of Shoujii, Hsiao and Otani, by using a nitride, as taught by Tsunemitsu, to provide electrical insulating properties."

Responsive hereto, Applicant notes that dependent claim 40 is indirectly dependent from independent claim 37, and Applicant urges that dependent claim 40 is allowable in that it depends from an allowable base claim.

In paragraph 11 of the Office Action claims 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoujii et al in view of Hsiao et al and Otani, as applied to claims 37 and 38 above, and further in view of Latta et al 4,526,629, stating:

> "Shoujii, as modified by Hsiao and Otani, discloses the claimed manufacturing method as previously discussed in Claims 37 and 38 above. The modified Shoujii method does not teach that the preferred thickness of each lamination, or layer, is 10 to 20 angstroms. Latta teaches that the preferred thickness of each lamination (e.g. each oxide layer) can be less than 3 nm (i.e. less than 30 angstroms), which would be inclusive of the claimed range of 10 to 20 angstroms (see Claims 2 through 4 of Latta). The benefit of Latta's preferred thickness provides a pattern of layers that have insulating properties with high quality and low cost (col. 2, lines 33-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Shoujii, Hsiao, and Otani, by forming each lamination, or layer, with the preferred thickness of Latta, to positively provide insulating properties with high quality and low manufacturing cost."

Responsive hereto, Applicant notes that dependent claims 42 and 43 are each dependent from claim 38 which depends from independent claim 37, and Applicant urges that dependent claims 42 and 43 are allowable in that they depend from an allowable base claim.

Having responded to all of the paragraphs of the Office Action, and having amended the claims accordingly, Applicant respectfully submits that the Application is now in condition for allowance. Applicant therefore respectfully requests that a Notice of Allowance be forthcoming at the Examiner's earliest opportunity. Should the Examiner have any questions or comments

with regard to this amendment, a telephonic conference at the number set forth below is respectfully requested.

Respectfully submitted,

Dated: October 27, 2006

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I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313.

October 27, 2006
(date)

(Signature of Patricia Beilmann)